Attachment 4. Project Description

The Littlerock Creek Groundwater Recharge and Recovery Project (LCGRRP) feasibility study project description is provided below.

Attachment 4 also includes the following exhibits (included as a single CD ROM in the hard copy and as individual PDF files in the BMS):

- Antelope Valley Integrated Regional Water Management Plan (Att4_LGA12_PWD_ProjD_2of5)
- Palmdale Water District 2010 Urban Water Management Plan (Att4_LGA12_PWD_ProjD_3of5)
- Palmdale Water District Strategic Water Resources Plan (Att4_PWD_LGA12_ProjD_4of5)
- Palmdale Water District Strategic Water Resources Plan, Draft Program Environmental Impact Report (Att4_LGA12_PWD_ProjD_5of5)

Project Description

The Palmdale Water District (PWD) is located in the southern part of the Antelope Valley. Figure 4-1 shows the location of the Antelope Valley, the PWD, and State Water Project facilities in the area. The PWD provides retail water service to parts of the City of Palmdale and unincorporated parts of Los Angeles County. The PWD is a State Water Project (SWP) contractor with a Table "A" contract amount of 21,300 acre-ft/yr. As of 2010, the PWD provides groundwater from the Antelope Valley and treated SWP and Littlerock Creek water to about 26,000 customers. PWD customers include residential, commercial and industrial water users. The historical and projected demands, expressed in acre-ft/yr, for the PWD are shown below.

Historical and Projected Water Demands

Year	Demand
2005	23,600
2010	19,800
2015	35,000
2020	40,000
2025	45,000
2030	55,000
2035	60,000

The PWD completed a Strategic Water Resources Plan (SWRP) in 2010 and is currently finalizing a California Environmental Quality Act (CEQA) process on the SWRP prior to adopting the SWRP in the summer of 2012. The water supply plan contained in the PWD 2010 Urban Water Management Plan (UWMP) and the 2010 SWRP, expressed in acre-ft/yr for a single dry year, is summarized below.

Single Dry Year Supply and Demand Comparison

Supplies	2015	2020	2025	2030	2035
Current Water Supplies					
Groundwater[1]	12,000	12,000	12,000	12,000	12,000
SWP water	1,491	1,704	1,917	2,130	2,343
Littlerock Dam	4,000	4,000	4,000	4,000	4,000
Planned Water Supplies					
Recycled Water	1,000	3,000	6,000	9,000	12,000
Groundwater Banking	8,254	9,648	10,541	13,935	14,828
New Supplies[2]	8,255	9,648	10,542	13,935	14,829
Total Supply	35,000	40,000	45,000	55,000	60,000
Total Demand	35,000	40,000	45,000	55,000	60,000
Surplus/(Shortage)	0	0	0	0	0

Note:
1. Some of this groundwater production will have to be replenished after the current adjudication process concludes.
2. Includes new recycled water sources and additional groundwater banking.

The Antelope Valley groundwater basin has been in overdraft continuously since about 1930. In 1999, the pumpers in the Valley commenced legal action to adjudicate production rights in the Basin. The adjudication reached a milestone in the spring of 2011 with the Court issuing a ruling that the safe yield is 110,000 acre-ft/yr. Current aggregate production is about 170,000 acre-ft/yr; the basin is in a state of overdraft of 60,000 acre-ft/yr. The adjudication process continues on today with the goals to allocate the safe yield among the parties and to implement a physical solution that ensures sustainability.

At present, it is unclear what pumping rights in the safe yield will be allocated to the PWD or to any party to the adjudication. What is clear is that the PWD will be required to replenish its groundwater production in excess of the safe yield allocated to it. It is also clear that the PWD and the adjudication parties will need to bank imported water in years when it is available in excess of their current need for years when the imported water is scarce.

To ensure sustainability, net[1] groundwater production in the Antelope Valley will need to be limited to the safe yield, and the location and magnitude of production will have to be modified to minimize subsidence and to ensure sustainable production. A 400-square mile part of the central Antelope Valley has sustained significant subsidence. Over 400,000 acre-ft of water has been mined from fine-grain sediments since 1951, causing as much as six feet of subsidence and ground fissures at Edwards Air Force Base. Recent groundwater simulation work conducted by the USGS[2] suggests that the combination of reducing groundwater production in the subsidence area to levels that eliminate new subsidence and the relocation of production outside the subsidence area coupled with groundwater

[1] Net groundwater production is defined herein as the production after replenishment for production in excess of safe yield.
[2] This work is currently being finalized and the final report is expected by the end of calendar 2012.

recharge projects, as described herein, are absolutely necessary to ensure sustainable production and to minimize subsidence. The parties involved in the ongoing adjudication are discussing a range of groundwater banking projects that involve the storage of imported water when surplus water is available for subsequent recovery and use when imported water is less available.

In its SWRP, the PWD proposed banking programs that include the development of new spreading grounds and recovery facilities that it can use to recharge imported water and potentially recycled water:

- to replenish its overproduction pursuant to the future settlement in the ongoing adjudication,
- to store imported water in surplus years to meet future replenishment obligations when imported water is scarce, and
- to recover stored water during imported shortages.

The PWD has determined that it will ultimately require 105,000 acre-ft/yr of recharge capacity to meet its reliability goals and to meet new future demands.

The LCGRRP is the largest of among four recharge projects included in the PWD's 2010 SWRP. The four projects and their anticipated capacity, expressed in acre-ft/yr, are listed below.

Planned Recharge Projects in the Palmdale Water District Strategic Water Resources Plan

Recharge Project	Projected Recharge Capacity
Upper Armargosa Creek	3,360
Lower Armargosa Creek	40,070
14E	18,480
Littlerock Creek	43,090
Total	105,000

The location of the LCGRRP is shown in Figure 4-2. Figure 4-2 also shows the PWD service area and PWD's existing wells. The PWD will construct a well field adjacent to the recharge area to recover the water recharged in the project. The LCGRRP is proposed to be a run-of river recharge project, utilizing the existing active natural channel system and a series of shallow recharge basins in the adjacent floodplain, to recharge SWP and recycled water. There are multiple ways to conduct the recharge of imported water in Littlerock Creek with the magnitude of desired recharge and the recharge capacity of the active stream channel dictating the scale of the project. In its simplest form, the proposed LCGRRP could consist of the following:

- SWP and other imported waters would be discharged from the East Branch of the SWP aqueduct where the aqueduct crosses Littlerock Creek. Imported water would be conveyed in the active channel of Littlerock Creek, toward the project endpoint located about nine miles downstream of the aqueduct.

- Imported water discharged to Littlerock Creek would be modulated to ensure that all of the imported water discharged to Littlerock Creek recharged in the active channel in the project area.
- Imported water recharge will occur when capacity exists in the East Branch of the aqueduct, primarily in the winter time over a period of 90 to 120 days.[3] Recharge could occur at other times of the year, provided that there is SWP water available surplus to the then current demand or when surplus capacity in the aqueduct is available to convey non-SWP water to the LCGRRP.

The project would be expanded as follows if the desired recharge cannot be accomplished in the active channel within the project area or if recycled water recharge is included in the recharge project:

- A diversion works would be constructed in the active channel just upstream of Palmdale Boulevard to split the remaining discharge in Littlerock Creek such that the imported water discharge remaining in Littlerock Creek can completely recharge in the active channel in the project area.
- The diverted imported water would be conveyed to shallow off-channel basins constructed adjacent to the active channel and within the floodplain. Imported water diverted into these basins would recharge completely within the project area.
- The off-channel basins would be constructed in a strip of land parallel to the active channel. A feeder channel would be constructed from the diversion works at Palmdale Boulevard and run along the west side of the off-channel basins. The feeder channel would convey imported water from the Littlerock Creek diversion to individual off-channel basins.
- The imported water discharge to Littlerock Creek would be modulated to ensure that all the imported water discharged to Littlerock Creek would be completely recharged in the active channel and off-channel basins in the project area.

Recycled water recharge would be accomplished by conveying recycled water to the off-channel basins in the project area. Dilution pursuant to the Department of Public Health draft[4] CCR Title 22 regulations would be provided by imported water recharge in the same facilities and groundwater underflow.

The recharge and recovery capacities of the project are projected to be about 43,000 acre-ft/yr and 14,000 acre-ft/yr, respectively. Preliminary groundwater modeling studies[5] have demonstrated that the LCGRRP will substantially reduce drawdown in the PWD service area and areas surrounding the project. The recharge project will increase piezometric levels in the southern part of the subsidence area and provide regional benefits, including the reduction of subsidence in the central part of the Antelope Valley. For these reasons, the other SWP contractors in the Antelope Valley, the Antelope Valley East

[3] The design duration of recharge will be developed in the proposed feasibility investigation. The duration of recharge will depend on the availability of surplus unused capacity in the East Branch of the SWP that can be used by the PWD, AVEK and LCID to convey SWP water and non-SWP water to the LCGRRP.
[4] The Department of Public Health has expressed that it will finalize these regulations in later 2012 or early 2013. The recycled water recharge component in the LCGRRP would be designed consistent with the final regulations.
[5] Modeling studies were done to evaluate banking programs in the SWRP.

Kern Water Agency (AVEK), and the Littlerock Irrigation District (LCID) have endorsed this project, and will likely be partners in its implementation.

The feasibility study proposed herein will develop facility and operating plans for recharge facilities in and adjacent to the active Littlerock Creek channel, determine the recharge capacity of the Littlerock Creek recharge project, determine the fate of the recharge water under different recovery schemes, prepare cost opinions, complete an initial environmental study, and finally assess the feasibility of the LCGRRP.

The PWD is committed to the goal of improving the sustainability of its water supplies and has demonstrated its commitment via its participation in and funding of both regional and local water planning efforts, including:

- Member of the Antelope Valley State Water Contractors Association which is the designated monitoring entity for the Antelope Valley CASGEM program.
- Project participant in the Upper Amargosa Recharge Project.
- Member of the Antelope Valley Regional Water Management Group (RWMG), who collaboratively prepared the Antelope Valley Integrated Regional Water Management Plan (IRWMP).
- Litigant and active participant in the Antelope Valley groundwater adjudication, which is currently in the process of allocating the safe yield among the parties and developing a physical solution that ensures sustainability for the basin.
- Member of a group funding the USGS in their update of the Antelope Valley groundwater flow model.

PWD is committed to funding a significant portion of this study with non-state monies and will continue to fund the development of the LCGRRP beyond the 2012 LGA grant program.

The PWD will disseminate information related to the LCGRRP feasibility investigation to all groundwater users, project stakeholders, Antelope Valley groundwater adjudication litigants, and the general public and will provide a forum to publically and transparently provide input to the LCGRRP proponents. The following public outreach efforts will be made:

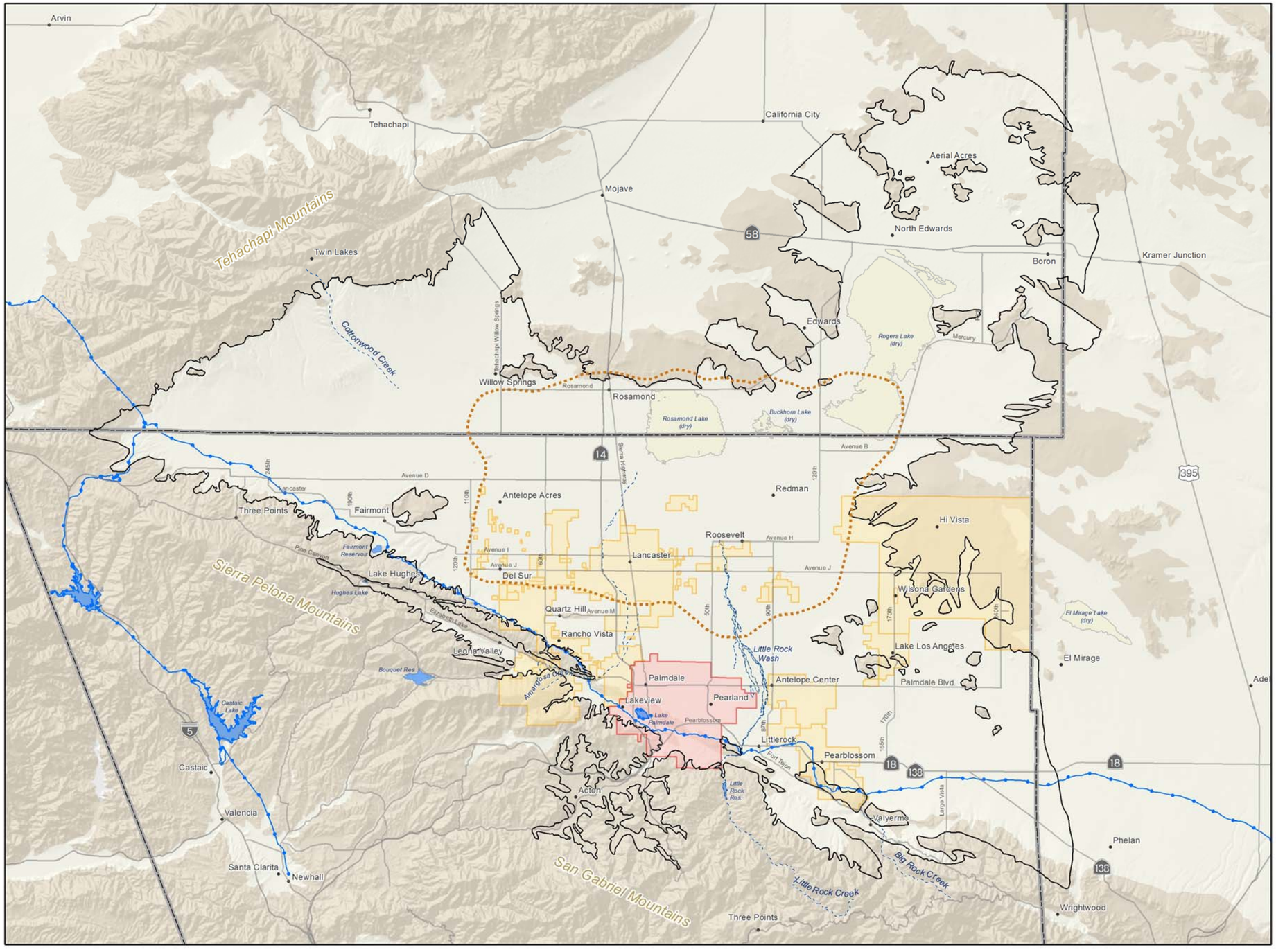
- A website will be created to allow public access to the task reports, meeting and workshop notices, agendas, presentations and minutes, and the final report.
- Three public workshops will be conducted to review the preliminary LCGRRP alternatives, the alternative performance and impact analysis, and to review the final LCGRRP alternatives and feasibility.
- The results of this feasibility investigation will be disseminated to all the litigants in the ongoing Antelope Valley groundwater adjudication through the continuing mediation process and the Antelope Valley IRWMP process.

- Progress reports and the final report will be presented at two annual meetings of the Association of California Water Agencies, the annual conference and meeting of the Groundwater Resources Association (GRA) of California, and at two specialty GRA conferences where specific technological innovations and applications are discussed.

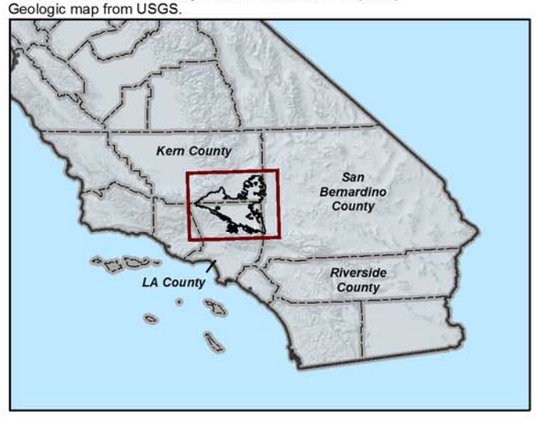
As provided in the table below, the LCGRRP is consistent with and supports many of the IRWMP objectives.

LCGRRP Consistency with the IRWMP Objectives

IRWMP Objective	LCGRRP Consistency with IRWMP
Water Supply Management	
Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2035.	Increases the ability to recharge and store supplemental water when available, thereby improving the reliability of water supplies to the Antelope Valley.
Establish a contingency plan to meet the water supply needs of the Antelope Valley Region during plausible disruption of SWP water delivers.	No direct impact.
Stabilize groundwater levels at current conditions.	Groundwater levels will rise in response to coordinated management of pumping and recharge in the LCGRRP.
Water Quality Management	
Provide drinking water that meets customer expectations.	No direct impact.
Protect aquifer from contamination.	No direct impact.
Protect natural streams and recharge areas from contamination.	No direct impact.
Maximize beneficial use of recycled water.	Recycled water recharge will occur as part of the LCGRRP.
Flood Management	
Reduce negative impacts of stormwater, urban runoff, and nuisance water.	No direct impact.
Environmental Resource Management	
Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley.	The development of the LCGRRP will establish natural areas for groundwater recharge that will preserve open space and natural habitat.
Land Use Planning/Management	
Maintain agricultural landuse with the Antelope Valley.	No direct impact.
Meet growing demand for recreations space.	No direct impact.
Improve integrated land use planning to support water management.	No direct impact.



Notes:
Groundwater basin boundary from DWR Bulletin 118 (2003)
Geologic map from USGS.



Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: WEL
Date: 20120706
File: Figure 4-1.mxd

0 7 14 Miles
0 10 20 Kilometers

Antelope Valley Groundwater Basin

LCGRRP Feasibility Study

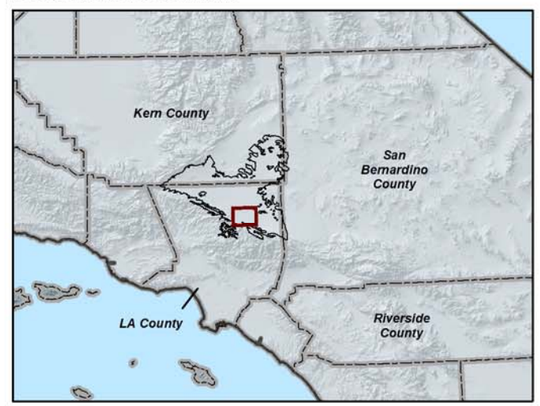
Figure 4-1

118°5'0"W
118°0'0"W
117°55'0"W
34°35'0"N

Little Rock Creek
50th St E
40th St E
70th St E
90th St E
110th St E
87th St E
E Avenue N
E Avenue O
E Avenue P
E Avenue Q
E Palmdale Blvd
E Avenue R
E Avenue S
E Avenue T
E Avenue U
Pearblossom Hwy
Sierra Hwy
Fort Tejon

SWP California Aqueduct
Diversion Structure
Littlerock Creek In-channel Recharge Area
Feeder Channel
Off-channel Recharge Basins
Palmdale Water District Well (active)
Recovery Well Field Area
Area of Subsidence
Palmdale Water District

Notes:
Aerial photo base from 2009 NAIP.



Produced by:
WILDERMUTH ENVIRONMENTAL INC.
23692 Birtcher Drive
Lake Forest, CA 92630
949.420.3030
www.wildermuthenvironmental.com

Author: WEL
Date: 20120706
File: Figure 4-2.mxd

0 1 2 Miles
0 1 2 3 Kilometers

Project Location

LCGRRP Feasibility Study

Figure 4-2

Attachment 4 Exhibits

- **Antelope Valley Integrated Regional Water Management Plan (Att4_LGA12_PWD_ProjD_2of5)**
- **Palmdale Water District 2010 Urban Water Management Plan (Att4_LGA12_PWD_ProjD_3of5)**
- **Palmdale Water District Strategic Water Resources Plan (Att4_LGA12_PWD_ProjD_4of5)**
- **Palmdale Water District Strategic Water Resources Plan, Draft Program Environmental Impact Report (Att4_LGA12_PWD_ProjD_5of5)**